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IMPURITY DIFFUSION DEVICE FOR SEMICONDUCTORS

CLAIM(S)

An impurity diffusion device for semiconductors, which is a device for applying the diffusion to said semiconductor wafers by loading and heating in a tube container the semiconductor wafer along with a crucible accommodating the diffusion source substance in particle or cake form that is to be diffused to the semiconductor, characterized in that a baffle layer for preventing the non-gasification flying of the diffusion source substance is installed on the diffusion source substance dissipation port.

An impurity diffusion device for semiconductors, as cited in Claim 1, wherein the baffle layer is a quartz layer in woolen sheet form.

DETAILED DESCRIPTION OF THE INVENTION

The present invention pertains to an impurity diffusion device for semiconductors, particularly to a diffusion device wherein the sealed tube diffusion to the semiconductors is improved.

With the prior art sealed tube diffusion device for a silicon wafer, there is like the one shown in Fig. 1. In the figure, 1 indicates the sealed tube

container made of quartz tube, 2 a boat for the wafers for supporting the silicon wafers 3 and 3' in parallel inside said container, and 4 a crucible installed on both ends of said boat for accommodating the diffusion source substance 5. The diffusion source substance, for example, is Ga-Ge. When this sealed tube is loaded and heated in heating furnace 6, the diffusion source substance is dissipated and dispersed inside said sealed tube, reaches the surface of the silicon wafers 3 and 3', and is diffused.

By the prior art device, Ga-Ge is "scattered," (non-gasified flying) and forms spots on a silicon wafer surface, as shown in Fig. 2. This abnormal diffusion tends to locally generate Xj defects and ρs defects that penetrate through the SiO_2 layer even if the 1-2 μ thick SiO_2 layer is preliminarily formed on the wafer surface by thermal diffusion. As a measure to this problem, there is a method whereby the second and third wafers from the crucible are replaced with a dummy wafer. With this method, however, the Ga concentration becomes lower and a getter effect is reduced. In addition, the ρs becomes high and Na becomes low in the silicon wafer located apart from the source, so the defects in the wafers and the use of dummy wafers result in a loss of materials.

The present invention attempts to present an impurity diffusion device that can solve the aforementioned problems.

With the impurity diffusion device for semiconductors of the present invention a baffle layer, which can prevent the non-gasification flying of the diffusion source substance, is installed on the diffusion source substance dissipation port of the crucible for accommodating the diffusion source substance in the sealed tube diffusion device, and the baffle layer is made of quartz layer in woolen sheet form.

Subsequently, the impurity diffusion device for semiconductors into which the present invention is embodied as its one example is explained in detail below with reference to the figures. In Fig. 3 showing sectional views of said device, (a) indicates a vertical sectional view of the heating furnace, and (b) its a cross-sectional view. In the figures, 1 indicates the sealed tube container made of quartz tube, 12 the boat for wafers for supporting silicon wafers 2 and 3' in parallel inside said container, 14 the crucible installed on both ends of the boat for accommodating the diffusion substance 5. Inside said crucible, after the diffusion source substance is filled, there still is a remaining space between the substance and the top edge of the crucible. In this space, a baffle layer 7 is placed. For said diffusion source substance, for example, Ga-Ge particles were used. For the baffle layer, for example, a quarts layer shaped like a woolen sheet with nearly 8 μm or thicker was effective. The thickness of said quartz layer like a woolen sheet can be

selected properly taking into account the woven condition of the quartz layer (density and baffling effect). The Ga-Ge alloy in the crucible is attached once to the baffle layer and subsequently the Ga steam alone is dissipated in the sealed tube.

By the present invention, the diffusion wafer free from defects of Xj, ρs, and Ns caused by "scattering" can be manufactured. Since the "scattering" does not occur to the device of the present invention, the dummy wafer is not needed. Therefore, the wafers can be economized, and the number of processed wafers is increased (by the number equivalent to the number of dummy wafers), which is advantageous. In addition, the present invention comes with another advantage that it can be implemented without dramatically improving the device.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a sectional view of the prior art device. Fig. 2 shows an anterior view of the wafer manufactured by using the prior art diffusion device. Fig. 3 shows a sectional view of the diffusion device, which is one embodiment example of the present invention. In the figure 3, (a) and (b) indicate a vertical sectional view of the device and a cross sectional view of the device, respectively. In the figures, the same numbers indicate one same component or the equivalent component.

1. sealed tube container

3.3'. silicon wafers

5. diffusion source substance

6. heating furnace

7. baffle layer (quartz layer shaped like a woolen sheet form)

12. boat for wafers

13. crucible

Translations
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